

TECHNICAL BULLETIN

ECODESIGN



1. INTRODUCTION^{1,2}

ISO 14006:2011 provides guidelines to help organizations establish, document, implement, maintain and continually improve ecodesign management as part of their environmental management system (EMS). It applies to those environmental aspects related to the product in which the organization may have control or influence.

Consequently, it is essential to understand what the term Ecodesign refers to, its origin and justification, and then proceed to describe the content and actions necessary for the implementation of the ISO 14006:2011 standard.

2. ECODESIGN

2.1. Definition

Ecodesign is the methodology that integrates environmental criteria in the design of products and services, aimed at reducing the environmental impacts they produce throughout their life cycle, maintaining or improving their functionality.

By integrating ecodesign tools into a general product development process (already complex and adjusted to pre-established times), the challenge increases.

The last stage of use, final disposal, is essential in the life cycle: how will the product be used? In this phase, each user will probably do different things, the patterns of use and consumption will be different in each region, culture or economic model. However, when designing a product certain limits of use can be forced through the form, function and the way

of communicating its use. On many occasions, the efficient use of natural resources in the stage of product use will depend on this. The previous stages define the product, but it should not be forgotten that it will have a final disposal and transportation and that, perhaps, it can be reintegrated into another production system through the recovery and recycling of materials.



Figure 1. Product life cycle.

Ecodesign tools and life cycle thinking allow us to deliver a product that meets the needs of the customer, the manufacturer and the distributor.

Simultaneously, the product will have significantly lower environmental impacts than others that have not integrated these tools into their conception and design.

To carry out the eco-design of a product, according to the ISO 14006 standard, the environmental impacts of said designs must be measured and calculated based on life cycle analyzes (LCA), in order to make decisions based on their results.

2.2. Ecodesign: Justification.

Climate change and the scarcity of resources are the elements that have promoted the design and use of environmentally friendly products.

For its part, compliance with the legal obligations that are being developed worldwide constitutes one of the most weighty arguments in the adoption of this design process, with special emphasis on the guidelines that establish the obligations of the producer in the final disposal of their products.

Similarly, the demand for environmentally friendly products shows significant growth compared to products lacking this characteristic, since new “green” products appear on the market daily.

To date, tools have been developed that allow the analysis of the entire life cycle of products and technologies that allow the use of recycled materials and the reduction of the use of hazardous materials, among other actions. The use of these tools contributes directly to modify the design process, with the consequent impact on the cost of resources.

2.3. Ecodesign: Characteristics.

Figure 2 lists the characteristics that an ecodesign must consider, in each of the stages of its life cycle, namely: obtaining materials, production, distribution, use and final disposal.



Figure 2. Life cycle and strategies of Ecodesign.

2.3.1. Obtaining materials.

- Minimize the use of materials.
- Use renewable resources, recyclable, recycled materials and/or waste such as by-products of the process.
- Avoid the use of toxic and dangerous substances.
- Avoid the use of substances that destroy the ozone layer.
- Avoid or reduce the production of greenhouse gases.
- Use materials with low energy content in their production.
- Minimize the variety of materials used.

2.3.2. Production

- Improve production control and operating practices to minimize waste and rework.
- Establish changes in production techniques, with the simplification of assemblies and the automation of processes.
- Reduce the consumption of resources (energy, water, primary materials).

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- Prevent and reduce the production of waste and emissions.

2.3.3. Distribution

- Reduce the weight of products or their packaging.
- Use reusable and/or recyclable packaging.
- Use efficient transport systems (reduction of fossil fuel consumption).

2.3.4. Use

- Design with a view to greater durability of the product, considering its proper use, identifying and eliminating (or minimizing) the weakest points, anticipating easy maintenance and repair and future improvements through the use of modular elements.
- Implement greater energy efficiency:
 - ✓ Look for synergies; improvements in energy efficiency in one element can have an impact on the total system.
 - ✓ Reduce energy losses in electronic equipment that is kept on "stand by".
 - ✓ Plan "half load" operations.
 - ✓ Carry out simulations in the use laboratory.
- Create with a view to greater efficiency in water consumption, the use of materials, and the reduction of production of hazardous substances.

2.3.5. Final disposition

- The design must allow the reuse of the product.

- Use materials that already have recovery channels, in such a way that the separation of materials and their reinsertion in the production chain is anticipated, once the useful life of the product has ended.
- Design products with the use of pressure fit methods, connection points, easily accessible joints and the presence of modular elements, among others, that allow their disassembly.

2.4. Ecodesign: Advantages.

Beyond the demands of the market and the laws, the implementation of an ecodesign process brings with it advantages for all the sectors involved, in terms of the market and environmental impact:

- Reduced costs for the company and the end user.
- Improvement of the image of the product and the organization.
- Access to new, more demanding markets.
- Better positioning of the product and the company before the competitors.
- Drive innovative products.
- It makes it possible to focus improvements, as long as a life cycle analysis is carried out to detect improvement points.
- Good positioning in processes of buy "green".

2.5. Ecodesign: Case studies.

2.5.1. Nationals

Polinter and Indesca have worked on projects that can be framed within ecodesign on the

procurement of materials, where the use of materials has been minimized or recyclable, recycled and/or waste materials have been used as by-products.

2.5.1.1 Plastic pallets

The plastic pallet is manufactured through the injection process and nitrogen foaming, usually with a mixture of injection resins, recycled polyethylene and injection by-products.

The properties of the mixtures of virgin/recycled material measured indicate that it is feasible to use up to 10% recycled material from pallets in their manufacture.

In the same way, other evaluations indicate as possible the use of up to a maximum of 25% of the regrind of drawers in the production of popsicles.

2.5.1.2 Plastic desk

One of the advantages of replacing traditional desks with polyethylene ones is that a 100% recyclable product is obtained. Once these desks reach the end of their useful life, they return to the factory to be reprocessed into a new product again. Theoretically, it is a product that does not produce environmental waste.

Traditional desks last less and have a greater variety of materials and are more difficult to recycle.

Additionally, according to the opinion of the users, the plastic desks offer greater ergonomics, safety and by guaranteeing a proper posture for writing, it benefits the learning capacity of the students.

2.5.1.3 PE bags for packaging PVC

In 2006, the development of plastic bags began to replace the paper bags with a filling valve used in the bagging of a type of resin.

Considering the performance requirements for this application, the development of a bag with a three-layer structure with a thickness of 180 μm was proposed, using national polyethylenes.

Subsequently, in 2011, new structures were developed and proposed, with a view to reducing the thickness of the sac from 180 to 160 μm . Performance tests with this thickness were satisfactory.

In 2013, a new study determined that it is feasible to reduce the thickness of the PVC packaging bag by an additional 10-15 microns.

Therefore, by reducing the thickness, this design is part of the eco-design in obtaining materials, where the use of raw materials is minimized.

2.5.2. Internationals

2.5.2.1 SOKA Packaging Evolution in glass

The raw material of a coextruded sheet (PS/adhesive/PE/paper with adhesive (Belgium and Spain)/foil (France)/resin) was replaced, which is difficult to recycle as it is multimaterial, and the label of a very adherent paper, by a new PP cup with direct printing, which greatly facilitates its recycling. The initial product also generates a larger footprint of carbon because

the waste in the production line was not recoverable and due to the transport of the raw material from Europe to Colombia.

Additionally, the carbon footprint was reduced because the factory was moved to a shorter distance from the largest distribution center in Colombia, thus reducing the kilometers of transportation per ton of product, which generates a lower environmental impact.

With these changes, the carbon footprint decreased by 38%, from 84 tons/month with the initial vessel to 53 tons/month with the current vessel, and it has been planned to reach a total reduction in 45% with the consumption of only 47 tons/month in the future.

When breaking down the reduction obtained, we have to:

- The saving of the change in raw material was only 5%, but it was possible that 97.7% of the material could be recycled.
- Post-industrial waste is reduced to zero, because it can be used again in the manufacture of glasses.
- The product offers the same function but with better quality, because the previous glass had thickness problems.
- The greatest decrease in environmental impact occurred in moving the plant, from 65%.

2.6. Standard 14006:2011: "Environmental management systems - Guide for the incorporation of ecodesign".

2.6.1. Principles

The ISO 14006 standard helps organizations integrate ecodesign into their internal processes, with a life cycle approach. In this sense, the standard provides guideline:

- Manage ecodesign as part of an environmental management system or other management systems;
- Establish the appropriate processes and procedures to implement ecodesign in a structured manner, within an Environmental Management System.

The standard focuses on integrating ecodesign in the design and development process, as well as an environmental management system (EMS), leaving aside the evaluation of environmental impacts and the identification of solutions to improve them.

The steps that must be followed for the implementation of this standard are indicated below:

- (a) Identification and evaluation of aspects: For each stage of the product life cycle, the organization must identify the elements that can cause environmental impacts (air, water and soil pollution, climate change, among others), both input (consumption of materials, energy, water and other resources used) as output. In this way, those stages whose environmental impact can be reduced can be selected or

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removed at the design stage, so that the resulting product is less impactful to the environment.

- (b) Legal requirements and other requirements: the organization must pay special attention to the legal aspects related to the environmental aspects that are impacted throughout the life cycle of its products, to guarantee compliance with the respective regulations.
- (c) Communication: it will allow share information with different organizations that facilitate the development of solutions to reduce the environmental impact of their products; In addition, the provision of information actively to the affected agents (consumers, distributors, recyclers) must be maintained throughout the life cycle of a product, about its performance.
- (d) Operational control. It refers to the generation, establishment and control of the documentation related to the processes involved in the eco-design of a product. In addition, all suppliers and companies contracted for the design of products must be informed of the applicable procedures and requirements of the same.
- (e) Monitoring and measurement: Refers to the close relationship of all interdisciplinary work teams involved in the product design and development process, including sales, purchasing, advertising and manufacturing.

2.6.2. Highlights of the ISO standard 14006:2011

Ecodesign is integrated into environmental and quality strategies, referred to in the series of ISO 14000 and 9000 standards to which the ecodesign standard (14006) refers. In particular, the standard 14001 is frequently cited and many aspects are incorporated into it. The management structure of ISO 14006 is the same as ISO 9001.

The ISO 14001 standard establishes how to implement an effective environmental management system (EMS). An Environmental Management System (EMS) not only regulates what has to do with the environment and the facilities of an organization, but also implements procedures related to all the activities involved in obtaining its products, in relation to their environmental impact. , over which you may have control or influence. This management system guarantees not only the control of each of the activities involved, but also encompasses a commitment to continuous improvement of the organization.

The management system in which the 14006:2011 standard is framed guarantees that organizations operate under an ecodesign procedure now and in the future.

La Ошибка! Источник ссылки не найден. shows the relationship between ISO 14006 with other international standards.

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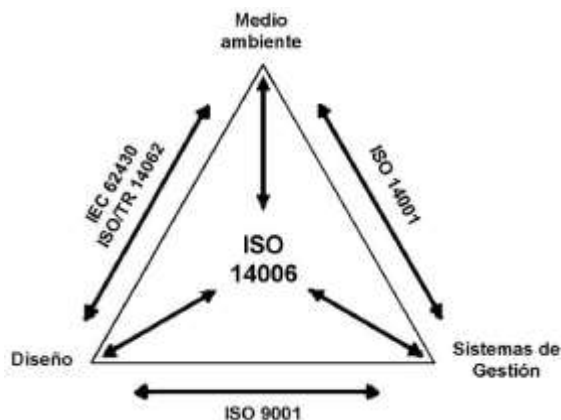


Figure 3. Relationship between some international standards and the areas of knowledge.

It is important to note that the 14006 standard does not have certification objectives. Compliance with this standard does not give the right to carry any badge that certifies the product as eco-design; however, in Europe they grant a certification based on this standard.

Like the others it refers to, ISO 14006:2011 focuses more on the process than on the application of ecodesign tools. That is why this standard is mainly considered a guideline for organizations when it comes to improving the environmental performance of their products and processes.

The ISO 14006:2011 standard follows a life cycle analysis approach to identify the environmental impacts of products and establishes the importance of subjecting suppliers to the same criteria.

Finally, although the ecodesign process focuses on the area of design and development, the ISO 14006:2011 standard highlights the importance of involving senior management and the person responsible for the environmental management system and their

necessary knowledge of ecodesign in the organization, to achieve its objectives.

2.6.3. Standard 14006:2011, Venezuela case

To determine the impact of the possible implementation of the ISO 14006 standard in the national processing sector, the key requirements (Figure 4) of the environmental management system of the design and development process are evaluated below.



Figure 4. Scheme and list of requirements.

1. Identificación y evaluación de aspectos.

At the Rio+20 Conference, a voluntary commitment was made that established that in 2015, developing countries - like Venezuela - would have a better database available, with information about each stage of the life cycles of goods and services, translated into the carbon footprint (CO₂ emissions) and the water footprint (consumption of water resources). In this way, this list would be tabulated together with other statistical indicators of each country, for consideration in decision-making in business and government, due to the fact that in Latin America there are many political decisions regarding the environment based on European data or other regions of the

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world and not in the region's own data.

Consequently, each organization in Venezuela should be encouraged to identify and evaluate the environmental aspects of its processes, registering the consumption of materials, energy, water and other resources, as well as the generation of waste and emissions generated in manufacturing. of its products, to contribute to the development of this database.

2. Legal and other requirements.

In Venezuela there are standards that regulate the management of waste disposal. Listed below:

- The Law of Comprehensive Garbage Management, in force since 2010, establishes in its articles, the following:

Article 35.- "Natural and legal persons, responsible for importing, **manufacturing** or distributing merchandise or distributing merchandise or mass consumption products **that generate solid waste, must have return programs for the recovery of their waste, including mechanisms of return or equivalent deposit**, collection, storage and transport, which guarantees its reuse in the production chain or its effective recycling, in accordance with the regulations."

Article 56.- "**The State will progressively limit the production**, importation, distribution and commercialization of containers, packaging, wrappers and disposable containers... Those that are made of **reusable, recyclable or biodegradable materials** are excepted, provided that their stockpiling, local collection

and there is demand for its use as a raw material."

- The Criminal Law of the Environment, in force since 2012, establishes the following in its article 4:

"Criminal responsibility. Criminal responsibility, for the purposes of environmental crimes, whose execution requires the violation of an administrative rule, is objective **and to prove it, it is enough to prove the violation, not being necessary to prove guilt.**"

Organizations must initiate the evaluation of their processes, to validate their compliance – or not – with the laws currently in force and establish the pertinent actions, if necessary, to guarantee full compliance with them.

3. Communication.

At this point, it is worth insisting on the importance that the Venezuelan processing sector generates the data of its processes and communicates them, in order to comply with the Rio+20 voluntary agreement and achieve the registration of these data as statistical indicators of the country, even being able to work to reduce their environmental impact.

4. Operational control / Monitoring and measurement

This requirement coincides with what is indicated in the section on design and development of the ISO 9001 standard. Therefore, for those Venezuelan companies that have an ISO 9001 certification, the implementation of this standard (ISO 14006) will be facilitated; companies that do not have this certification must work on preparing the

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corresponding documentation that will form the basis of the management system.

3. CONCLUSIONS

The ISO 14006 standard helps organizations integrate ecodesign into their internal processes, with a life cycle analysis approach, establishing the appropriate processes and procedures to implement ecodesign in a structured manner, within an Environmental Management System.

According to ISO 14006, organizations must:

- ✓ Identify the environmental aspects, input and output of your products that generate impacts to the environment and select those where these can be reduced or eliminated in the design stage, so that the resulting product is more friendly to the environment;
- ✓ Identify legal character requirements applicable to the product to be designed or redesigned, as a prior step to its incorporation into the design process, to ensure compliance.
- ✓ Maintain the flow of internal and external information, to facilitate the development of solutions to reduce the environmental impact of products.
- ✓ Establish, implement and keep documented all the processes to incorporate the existing ecodesign in the design and development processes. The ISO 14006 standard facilitates the incorporation of ecodesign in ISO 9001 and ISO 14001 systems; however, it is not decisive.

- ✓ Communicate the procedures and requirements applicable to suppliers, including external companies contracted to carry out the design.
- ✓ Stimulate the formation of interdisciplinary work teams -not only those directly related to the manufacture of the product- including commercial, purchasing, advertising and manufacturing.

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